Radio Spectrum Measurement System (RSMS) Operations

Outputs

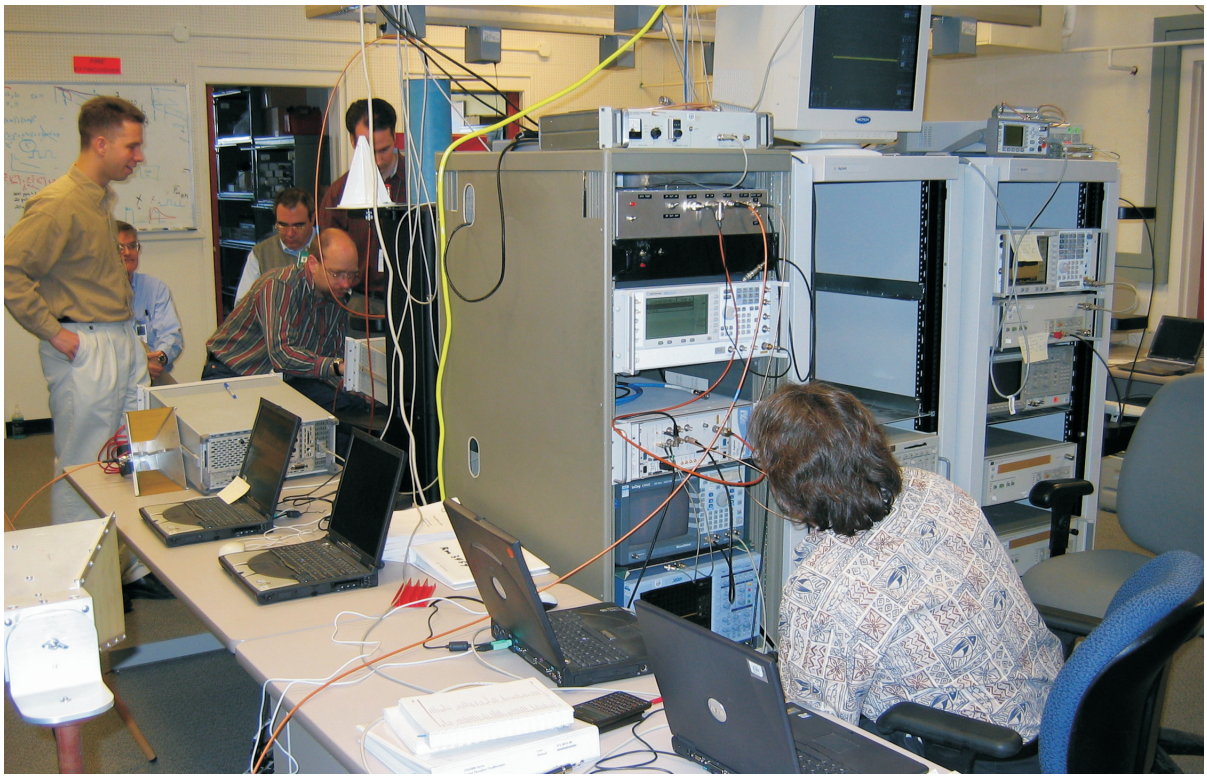
- Measurements to determine radio emission levels from broadband over power lines.
- Measurements to determine move-times and detection thresholds of dynamic frequency selection (DFS) devices.
- Measurements to determine the nature and extent of interference disrupting operations of an Air Force S-band satellite earth station receiver downlink.
- Measurements to determine radionavigation satellite service (RNSS) compatibility with radiolocation services in the 1260-1300 MHz band.

The Radio Spectrum Measurement System (RSMS) is a collection of equipment, measurement routines, and qualified personnel for performing critically needed radio signal measurements necessary for making decisions regarding Federal Government spectrum allocations. As stated under Departmental Organization Order 25-7, issued 5 October 1992, and amended 3 December 1993, the NTIA Office of Spectrum Management (OSM) is responsible for identifying and making arrangements for measurements necessary to provide NTIA and the various departments and agencies with information to ensure effective and efficient use of the spectrum. The RSMS resides at ITS in Boulder, and is tasked to perform measurements in support of OSM as required to fulfill their mission. ITS, through the RSMS Operations project, provides OSM and the executive branch with critically needed radio spectrum data, data analysis, reports, and summaries. Four basic areas of RSMS measurement are 1) spectrum surveys and channel usage, 2) equipment characteristics and compliance, 3) interference resolution and compatibility and 4) signal coverage and quality. In FY 2004, several different measurements were performed throughout the year in support of the basic mission.

In October of 2003, ITS personnel performed, as part of an ongoing effort, measurements to determine the radio emission levels from broadband over power lines (BPL). BPL is a new technology that transforms power lines into network cables that can deliver broadband content. BPL is transmitted over an unshielded medium, so the RSMS was used to perform measurements to determine the nature and extent of radiating fields due to this new technology. Three field measurements, each lasting approximately 2 weeks, were first conducted in late FY 2003 and then again in the early part of FY 2004. In conjunction with that work, modeling of the power lines was performed to describe the skyward radiation and the radiation that a mobile receiver would experience. The modeling was used to make predictions that were not easily accomplished by measurements alone. The measurement results and modeling were summarized and provided to OSM, the content of which were included in NTIA Report 04-413 (see Recent Publications below) as a response to an FCC notice of proposed rule making.

In January and April of 2004, laboratory measurements were conducted to determine move-times and detection thresholds of dynamic frequency selection (DFS) devices. DFS is a method whereby radio local area network (RLAN) devices, using the 5 GHz band for unlicensed operations, will detect the operations of radar and promptly evacuate the channel if the radar is present. Measurements were conducted to determine if current DFS devices comply with specifications given in ITU-R M.1658. This testing was used to support NTIA's comments and reply comments to the FCC UNII rule-making (FCC Docket 03-122). ITS support consisted of developing a radar signal simulator, developing testing algorithms, and performing the measurements.

In March of 2004, additional measurements were performed on various ultrawideband (UWB) modulations to validate existing bandwidth correction factor (BWCF) models. UWB is the term applied to very narrowly pulsed signals in which spectral emissions have an instantaneous bandwidth of at least 25% of the center frequency. For those who make policies regarding UWB emissions, it is worthwhile to know, when a certain signal with certain spectral characteristics is measured in one bandwidth, what the power is at another bandwidth. Different pulse spacing modulations of UWB signals result in different spectral characteristics. Focusing on the regions



Dynamic frequency selection compliance measurements performed at ITS (photo by J.R. Hoffman).

where the measurement bandwidth is equal to ½ the pulse repetition frequency (PRF) of the UWB signal, the purpose of the BWCF measurements was to examine the relationship between bandwidth and mean power for several representative UWB modulations. The results were used in compatibility analyses of UWB transmission systems and Federal radiocommunication systems.

In April 2004, ITS was called on to determine the nature and extent of interference that was disrupting operations of an Air Force S-band satellite earth station receiver downlink. Based upon preliminary tests performed at the facility by the Air Force, a correlation had been observed between the interference noted in the satellite receiver and the presence of an apparent spurious emission from the video carrier of a local television station. Measurements using the RSMS were conducted over the course of a week to determine the source of the interference. Results were provided to the Air Force summarizing the source of interference.

In June 2004, measurements were conducted to determine radionavigation satellite service (RNSS) compatibility with radiolocation services in the 1260-1300 MHz band. This work was in support of OSM, as well as the U.S. Administration in ITU-R Working Party 8B. The measurements determined and documented the jamming effects on this type of radar when (and if) the satellite signals in question are ever activated. The tests, which were done in coordination with the FAA, included jamming of actual aircraft blips as traffic was being tracked.

Measurements to determine Land Mobile Radio adjacent channel rejection characteristics were conducted for several months starting May 2004. These measurements are in support of an ongoing project to upgrade the sharing procedures described in Annex I of the NTIA manual.

Recent Publication

B. Bedford, A. Paul, and J. Richards, “Potential interference from broadband over power line (BPL) systems to Federal Government radiocommunications at 1.7 – 80 MHz: Phase 1 Study,”NTIA Report 04-413, Apr. 2004.

For more information, contact:
J. Randy Hoffman
(303) 497-3582
e-mail: rhoffman@its.bldrdoc.gov